

Docket No.: 043395-0378252
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Xing SU et al.	Conf. No. :	9817
Application No.:	10/697,682	Group Art Unit:	1654
Filing Date:	October 29, 2003	Examiner:	Julie Ha
Title:	METHODS AND DEVICE FOR ANALYTE CHARACTERIZATION		

REPLY BRIEF UNDER 37 C.F.R. § 41.41

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Examiner's Answer mailed March 17, 2010 ("Answer"), Appellants respectfully submit a Reply Brief pursuant to 37 C.F.R. § 41.41.

I. STATUS OF CLAIMS

A. Current Status of Claims

1. Claims pending: 1-8, 10-16, and 32-35
2. Claims canceled: 9, and 17-31
3. Claims withdrawn from consideration but not canceled: None
4. Claims allowed: None
5. Claims rejected: 1-8, 10-16, and 32-35

B. Claims On Appeal

The claims on appeal are claims 1-8, 10-16, and 32-35

II. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1, 4-5, 7-8, 10-14, 16 and 35 are unpatentable under 35 U.S.C. 102(b) as being anticipated by Chan (US Patent No. 6,210,896)?

Whether claims 1, 4-5, 7-8, 10-14, 16 and 35 are unpatentable under 35 U.S.C. 102(e) and (a) as being anticipated by Chan (US Patent No. 6,355,420)?

Whether claims 1, 3-5, 7-8, 10-14, 16 and 35 are unpatentable under 35 U.S.C. 103(a) as being unpatentable over Chan (US Patent 6,210,896)?

Whether claims 2, 6, 15 and 32-34 are unpatentable under 35 U.S.C. 103(a) as being obvious over Chan (US Patent No. 6,210,896) as applied to claims 1, 3-5, 7-8, 10-14, 16 and 35 in view of Thompson et al (US Patent No. 5,324,637)?

III. ARGUMENT

In the Examiner's Answer, the Examiner acknowledges that both Chan '896 and Chan '420 teach **metal** coated nanopores. (See e.g., Examiner's Answer, page 7, lines 10-12; page 10, line 22 – page 11, line 2). Nowhere does the Examiner state that either Chan '896 or Chan '420 teaches a **semiconductor** coated nanopore. Yet, the Examiner incorrectly continues to equate "metals" with "semiconductors." This is a fundamental fallacy that defeats all principles of physics and materials science.

The arguments below address specific statements made by the Examiner incorrectly equating metals with semiconductors.

- A. "The AC field applied capacitively with respect to the DC field generates an inhomogeneous field in nanochannel (see column 36, lines 14-19), meeting the limitation of inner surface of the nanopores coated with a semiconductor material." (Page 7, lines 12-15)

Example 6 of the Chan '896 reference, to which the Examiner is referring to, teaches an embodiment in which the nanopore includes a metal electrode and a metal waveguide. (Chan '896, column 36, lines 14-17). The application of the AC field to the DC field to create an inhomogeneous field in the nanochannel does not support the Examiner's conclusion that the nanopores of Chan '896 are coated with a semiconductor material. Nanopores using conducting materials for the electrode and waveguide would create an inhomogeneous field. There is simply nothing in the description of Example 6 of Chan '896 that would lead one of ordinary skill in the art to conclude that Example 6 teaches a nanopore coated with a **semiconducting material** as recited in independent claim 1.

- B. “Appellant's specification (published PG Pub 2005/0282229 AI) was utilized to define what a ‘semiconductor material’ is. The instant specification was used to identify what the property of what a semiconductor was.” (Page 18, lines 6-8) “The specification uses the conjunction “and/or”. This implies that semiconductor materials include silicon, silicon dioxide, silicon nitride, germanium, gallium arsenide and metal-based compositions.” (Page 18, lines 15-18)

In support of this statement, the Examiner quotes a portion from paragraph [0067] of the instant application (paragraph [0078] of the published application). For the Board’s convenience paragraph [0067] is repeated in its entirety:

[0067] Nanopores, nanotubes and/or nanochannels may penetrate one or more sensor layers. The **sensor layers** may comprise **semiconductor materials** including, but not limited to, silicon, silicon dioxide, silicon nitride, germanium, gallium arsenide, and/or metal-based compositions such as metals or metal oxides. Sensor layers may be processed by electronic beam, ion beam and/or laser lithography and etching to create a channel, groove, or hole. **Conducting layers** comprising metals may be deposited onto a semiconductor surface by means of field evaporation from a scanning tunnel microscope (STM) or atomic force microscope (AFM) tip or from a solution. **Insulating layers** may be formed by oxidizing the semiconductor's surface to an insulating composition.

Paragraph [0067] describes various sensor layer embodiments including: (1) sensor layers comprising a semiconductor **and/or** (2) sensor layers comprising metals or metal oxides. Paragraph [0067] also discusses semiconductors, conductors and insulators. The conducting layers, for example, comprise **metals** that may be deposited by field evaporation. Semiconductor materials include silicon, silicon dioxide, silicon nitride, germanium, and gallium arsenide. Applicants note, however, even if the second sentence of paragraph [0067] were read to include “metal based compositions,” the metal based compositions would still have to be semiconducting. Example semiconductor materials which “comprise” metals include III-V and II-IV compound semiconductors. These compound semiconductors have a band gap and no longer

exhibit “metallic” properties. Paragraph [0067] simply does not teach that metals are semiconducting.

- C. “Furthermore, it is well known in the art that metal is a known semiconductors. Most metals are semiconductors in some capacity.” (Page 18, line 21 - page 19, line 1).

The Examiner provides no support for this assertion. Indeed, Applicants have been unable to locate any reference which supports this assertion. Applicants, in contrast, have provided evidence - technical definitions of conductor, semiconductor and insulator. While the definitions supplied in the Response dated February 18, 2009 are from *Wikipedia*, Applicants note that the *Wikipedia* definitions are consistent with textbook definitions used in the art. That is, semiconductors and insulators have a band gap between the valence and conduction bands, with semiconductors having smaller band gaps relative to insulators while conductors (metals) do not have a band gap. That is, the conduction band and the valence band overlap in a metal. “Most metals” are simply not *semiconductors* in any capacity as understood in the art.

- D. “Step 2) (passing the labeled proteins, polypeptides or peptides through one or more nanopores) is a mental process, which does not involve any active method steps. In regards to the inner surface of the nanopores coated with a semiconductor material, this is not an active method step. This is a property of the nanopore, and the “coated” implies that the method step already occurred, and is no longer an active method step.” (Page 21, lines 3-7).

“A claim is anticipated only if ***each and every element*** as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegall Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). To establish *prima facie* obviousness of a claimed invention, ***all the claim limitations*** must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). See also MPEP 2143.03. That is, the Examiner is not free to simply ignore limitations or dismiss them as merely “metal steps.” Claim 1 recites, inter alia, “passing the labeled proteins, polypeptides or

peptides through one or more nanopores, an inner surface of the nanopores **coated with a semiconductor material.**” Semiconducting materials can be used as detectors in a way in which metals cannot. The nanopore coated with a semiconductor is a different embodiment than the nanopore coated with a metal. With the Examiner’s rationale, however, a method of building a corrosion resistant structure out of galvanized steel would be anticipated by a box made of uncoated steel. Such a position is clearly unreasonable.

- E. “Additionally, both germanium and gallium (specified as semiconductor material) are metal based compositions.” (Page 21, lines 9-10)

Germanium, like silicon, has a band gap. That is, in contrast to the Examiner’s assertion, Germanium is a semiconductor, not a metal. Gallium, unalloyed, is a metal, not a semiconductor. When Gallium (a group III metal) is alloyed with a group V element (N, P, Sb, As) in a roughly 50:50 composition, a compound semiconductor may be formed. The compound semiconductor no longer has the properties of metallic gallium. Thus, neither germanium nor gallium (when alloyed) can be considered “metal based compositions” as used by the examiner.

CONCLUSION

For at least the foregoing reasons, Appellant respectfully requests that the rejection of each of claims 1-8, 10-16, and 32-35 be reversed.

Respectfully submitted,

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By: /Martin Sulsky/

Martin Sulsky
Registration No.: 45,403
Attorney for Applicant(s)

Customer No. 86175
PILLSBURY WINTHROP SHAW PITTMAN LLP
P.O. Box 10500
McLean, VA 22102
Telephone: 703-770-7900
Facsimile: 703-770-7901